Working Trees Info

What is alley cropping?

Photo: USDA National Agroforestry Center

Annual crops, like corn, provide annual income while long-term crops like walnuts mature.

Alley Cropping is an agroforestry practice where agricultural or horticultural crops are grown in the alleyways between widely spaced rows of woody plants. Alley Cropping can diversify farm income, increase crop production, improve landscape aesthetics, enhance wildlife habitat and provide protection and conservation benefits to crops. By combining annual and perennial crops that yield mulitple products and profits at different times, a landowner can use available space, time and resources more effectively.

There are unlimited planting combinations for Alley Cropping systems. Common examples in the Midwest include wheat, corn, soybeans or hay planted in between rows of black walnut or pecan trees. Non-commodity or value-added crops may be incorporated for extra income, including sunflowers or medicinal herbs, planted in between rows of nut or fruit trees alternated with nursery stock trees or hazelnuts.

Alley Cropping can be used for other purposes such as short-rotation woody crops of fast growing woody species that are combined with forage or row crops to produce fuelwood and fodder. Plantings to enhance wildlife and pollinator habitat also can be designed using appropriate species.

Innovative landowners have developed a wide variety of other Alley Cropping designs and crop mixtures. For example, various combinations of chestnuts, hazelnuts, persimmons, decorative willows and ornamental foliage plants to produce greenery have been grown for farmers' markets and other niche markets.

Benefits of alley cropping

Diversification of income — Landowners who diversify by growing more than one type of crop are in a better position to tolerate market fluctuations or crop failures. Since timber, nut, or fruit-bearing trees may take a number of years to mature, the space between the rows can be used to grow other crops that require more sun during the early stages of tree establishment. In addition, the alleyway crops and trees mature at different times, which provides periodic income during the year, rather than relying on a single harvest period.

Improved soil health — Alley Cropping is a good option for areas prone to erosion or in a degraded shape, especially when tree and shrub rows are planted along contours. Woody roots in Alley Cropping systems help reduce soil erosion, increase water infiltration, add organic carbon to the soil, recycle and add nutrients and improve nutrient retention.

Improved crop health — Tree and shrub canopies in an Alley Cropping system protect the inter-crops against wind damage and insect pests, moderate air and soil temperature extremes, and reduce moisture loss from the soil. Reducing wind effects also aids in pollination activities by beneficial insects thus increasing yields of some crops.

Considerations for alley cropping

Harvest timing: Inter-row crop production must be carefully timed to avoid interfering with a potential woody crop harvest. In most cases, this is avoided because crops are grown mainly during the early years of tree establishment or during the growing season when there is little disruption by cropping activities.

Crop marketing: It is always important before starting a new crop to understand how and where the crop will be marketed. To assist in this, an enterprise budget with a cash flow plan is essential. This is especially critical and valuable for smaller, niche markets such as herbs, florals and specialty vegetables.

Equipment use: Alley Cropping designs should be spaced widely enough to allow proper handling of mechanized equipment (e.g., tractor, planter and sprayer). This includes allowing space for the growth of the tree crowns. Rows and alleys should be arranged to facilitate easy operation of the widest machinery to avoid damage to machinery, crops or trees.

Field Management: The system should be designed to optimize the use of light, water and nutrients between woody plants and the inter-crops. Severe competition can reduce crop and tree growth and yields, particularly during dry periods. Competition may be reduced by proper variety selection, spatial arrangement, and timing of planting and harvest, as well as by disking, or pruning tree limbs or roots. Weeds will need to be controlled in the tree rows for the first 3-5 years of establishment.

Woody Plant Selection Factors:

- Adapted to site and soils
- Produce appropriate shade
- Minimal roots at surface
- Potential multiple products
- Growth does not compete with inter-row crops

System Design: Depending on objectives, the woody plants can be planted in single or multiple rows. The woody rows may include plants that produce berries, florals, wildlife food, or other products. The inter-planted annual crops may be even more diverse: grasses for hay, cotton, soybeans, vegetables, ethnic herbs or various combinations of other crops. Crop choices depend on the priorities for production and preferences of the landowner.

Photo: USDA National Agroforestry Center

Shade tolerant grasses are baled in alleys between walnut trees.

Photo: USDA National Agroforestry Center

Alley cropping can be managed more openly like with these soybeans and walnuts

More information on the Web

USDA National Agroforestry Center http://www.unl.edu/nac/alleycropping.htm

The Center for Agroforestry http://www.centerforagroforestry.org/practices/ac.php

Association for Temperate Agroforestry http://www.aftaweb.org/alley_cropping.php

Natural Resources Conservation Service http://www.nrcs.usda.gov/technical/standards/nhcp.html

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USDA National Agroforestry Center

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